NATURAL RESOURCES CONSERVATION SERVICE

TREE/SHRUB PLANTING DESIGN PROCEDURES

(612DP)

Adapted Species by Type of Planting. All species must be adapted to the site and the intended purpose. For species suitability by soil series see Section II-Forestland Interpretations, Guide to Suitable Soils for Wood Crops, by Vegetative Zones, or by soils and Vegetative zones in Section II-Windbreak Interpretations, Conservation Tree/Shrub Suitability Groups, Tables 1-10. Refer to Section II, Windbreak Interpretations Table 11 for detailed information on species attributes including specific uses.

1. Production of wood crops:

   The following species are generally favored by woodland managers for the production of wood products:

American basswood	Black cherry	Pecan
Bur oak	Black walnut	Hackberry
Green ash	Silver maple	Northern red oak
Ponderosa pine	Eastern cottonwood	

2. Production of Christmas Trees:

   The following species are recommended for Christmas trees:

Scotch pine	Austrian pine
White fir	Eastern white pine
Ponderosa pine	Douglas fir
Blue spruce	

3. Production of fenceposts:

   The following species are recommended for fenceposts:

osageorange	black locust
ponderosa pine (treated)	eastern redcedar
northern catalpa	bur oak (treated)

4. Production of firewood:

   The following species are generally favored for firewood plantations:

Green ash	Siberian elm
Osageorange	Eastern cottonwood
Silver maple	Hickories
Honeylocust	Black walnut
Oaks	Hackberry

5. Riparian forest buffers:

   Refer to FOTG standard Riparian Forest Buffer (391)

6. General tree/shrub plantings for beautification, biodiversity, watershed protection, and conservation of soil and moisture

   Any adapted species that meet intended purposes.

7. Restoration of Declining Forest Habitat:

   Refer to FOTG standard Restoration and Management of Declining Habitats (643)

8. Wildlife Habitat:

   Refer to FOTG standards Wetland Wildlife Habitat Management (644) and Upland Wildlife Habitat Management (645)

Planting Sites. Refer to Tree Planting Procedures 380TPP for tree and shrub planting procedures for detailed information in addition to details that follow:

1. Cutover woodland (areas where timber harvesting has occurred)

   Planting in cutover woodland is generally for the purpose of supplementing natural reproduction, speeding up the stocking process, or increasing the number of desirable species.

   a. If the original woodland contained desired conifers such as Ponderosa pine, plant only the desired conifer species.

   b. Remove or kill undesired shrubs and trees before planting (weeding).

   c. Plantings on cutover woodland will require ongoing weeding operations on an annual basis.

2. Cropland and grassland

   a. Refer to Tree Planting Procedures 380TPP for tree and shrub planting procedures.

3. Interplanting on the woodland

   Interplanting is generally for the purpose of introducing desirable species in a stand of inferior species or for filling voids in the stand.

   a. Black walnut may be successfully planted in small openings in woodlands on deep well-drained moist soils.

   b. Use species that are shade tolerant for understory.

   c. Larger, undesirable trees will need to be cut or killed to provide needed sunlight.

4. Agroforestry/Alley cropping

   a. Agroforestry can be interpreted as the multiple use of trees to benefit agriculture. This would include windbreaks, timber, decorative florals, edible fruits/nuts, fuelwood, Christmas trees, and wildlife habitat plantings.

   b. Alley cropping is more specific to growing trees to produce a valuable product on the same acre as traditional agricultural crops including pasture and hay.

   c. Species such as black walnut or pecan are grown in rows between crops or pasture and are intensively managed to produce high value timber and/or nuts.

Initial Plant Densities (Tree/Shrub Spacings)

1. In plantations, tree spacing is related to the purpose of the planting, the site, and the size of maintenance equipment. Suggested spacings are as follows:

a. Critical area plantings i.e. gully control, erosion control, or stream bank stabilization - 2 by 2 feet or 3 by 3 feet.

b. Christmas trees - 5 by 5 feet minimum. Spacing between rows variable to accommodate equipment and other items identified in your management plan

c. Wood products (walnut, other sawlogs, firewood) - 8 by 8 feet or wider (refer to Table 1 for minimum and maximum initial planting density)

d. Riparian forest buffers - refer to FOTG standard Riparian Forest Buffer (391).

e. Alley cropping - distance between rows will vary depending on landowner objectives, site conditions, cultural practices, etc. Within tree rows usually 8' by 8' or wider, but can be closer if Christmas trees or shrubs are grown.

f. General tree/shrub plantings for beautification and other purposes will have varied spacings. Refer to Table 1 for minimum and maximum initial planting densities.

g. Landscape plantings shall be according to an approved landscape plan.

h. Tree/shrub plantings for wildlife habitat plantings will be done according to FOTG practice standards Wetland Wildlife Habitat Planting (644) and Upland Wildlife Habitat Planting (645).

i. Tree/shrub plantings for restoration of declining forest habitats will be done according to FOTG practice standard Restoration and Management of Declining Habitats (643). Refer to Table 1 for minimum and maximum initial planting densities for this purpose.

j. Tree and shrub plantings for all other purposes shall be planted according to the appropriate FOTG standard and initial planting densities will be done according Table 1.

2. Initial planting densities for trees/shrubs will depend on their average height at 20 years of age. Heights may be estimates based on:

   a. Performance of the individual species (or comparable species) in nearby areas on similar sites, or

      Predetermined and documented heights using Conservation Tree/Shrub Suitability Groups, Section II of the Field Office Technical Guide.

   b. Minimum and maximum initial tree/shrub planting densities are shown in Table 1 as follows:

Table 1 Initial Tree/Shrub Planting Density (saplings/plants/stems per acre)

Plant Types/Heights: (20-year tree/shrub height in ft.)	[2/] Minimum and Maximum Plant-to-Plant Spacing (feet)		Minimum and maximum Number of Tree/Shrub saplings/plants/stems (Per Acre)	
	Min.	Max.	Min.	Max.
[1/] Small shrubs (< 10')	3'	6'	1210	4840
Large shrubs and small trees including columnar trees (10' to 20')	6'	10'	440	1210
Large trees (> 20')	10'	15'	200	440

[1/] Small shrubs planted as understory for large trees do not need to meet minimum planting density requirements.

[2/] It is preferable that plant-to-plant spacing is equal between and within rows when possible. If necessary for maintenance a wider between row spacing is allowed as long as the minimum number of saplings/plants/stems per acre are planted.

3. To calculate initial planting density, determine the square feet per tree and divide it by the square feet in one acre. For example if initial planting density is 10'by 10' there is 100 square feet per tree/shrub seedling. Divide 43,560 sq. ft/acres by 100-sq. ft/seedling and the initial planting density would be 436 seedlings per acre. Refer to table 2 for various densities that have already been calculated.

Table No. 2 Various Spacings and Initial Planting Densities for Tree/shrub Seedlings

Spacing (feet)	Square Ft. per plant	No. of Trees/Shrubs Seedlings (stems) per Acre
2 x 2	4	10,890
5 x 5	25	1,742
6 x 6	36	1,210
6 x 8	48	907
8 x 8	64	680
10 x 10	100	436
10 x 14	140	311
12 x 12	144	302
12 x 16	192	227
14 x 14	196	222
10 x 20	200	218

4. Space shall be provided as necessary for access roads, harvesting, firebreaks, and management purposes.

Care and Maintenance/Protection

1. Refer to Tree Planting Procedures (380TPP) for detailed guidelines.

Management

1. Refer to Tree and Shrub Pruning Standard (660) and Forestland Improvement (666) for long-term guidance on forestry management.
2. Contact your local forester for assistance in developing a long-range forestry management plan.